THE LARVATRON: A COMPUTER CONTROLLED APPARATUS FOR REARING PLANKTONIC ANIMALS

Traditionally, workers studying the physical and biological requirements of planktonic animals have used manual methods for feeding the animals and maintaining the specific experimental conditions in each container (Kuban *et al.*, 1985; Diaz, 1987). However when factorial experiments are involved, with large numbers of experimental conditions, there are many problems with this approach. Changing the water, monitoring, and adding food, is labour intensive, and this limits the feasible size of the experiment. There may be gradients in temperature or light intensity within environmental cabinets or water baths, which can cause variation in growth and survival of the experimental animals. Manual handling during water changes may injure some animals and contribute to variation in results. For these reasons, experimental results can be variable and difficult to repeat (Wilkenfeld *et al.*, 1983). Therefore we have developed a method of automating the ongoing maintenance of larval cultures used in large-scale factorial experiments. The new system has the following advantages: minimal labor requirements, no variability due to manual handling; no position effects; and complete flexibility in experimental design, since the treatments are specified only by software.

All operations of the Larvatron are controlled by a personal computer. The rearing vessels travel around a circular track, driven by an electric motor. One tenth of the culture medium in each vessel is withdrawn and replaced on each circuit. Experimental conditions in each rearing vessel are defined in a computer file and the culture medium is made up as it is required for each rearing vessel, with the appropriate salinity, temperature and food concentration. Extensive monitoring and error-checking procedures are included in the computer software. This prototype was tested in two experiments studying growth and survival of penaeid larvae, while salinity, temperature, food density and larval density were varied. In favourable experimental conditions, survival to Mysis I was greater than 80%. In general, variation between replicates of a treatment was low and significant differences between treatments were evident.

Now that the prototype has been tested successfully, we have commenced construction of a full-scale version of the Larvatron, capable of handling 200 experimental culture vessels.

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DEEPWATER FISHERY FOR PRAWNS AND CARIDS OFF WESTERN AUSTRALIA

Deepwater prawns and carids have been fished commercially on the continental slope off northwestern Australia since 1985. The fishery operates by licence under a Commonwealth Development Plan. Operating from Port Hedland and Broome, the fishery (area 490,000 km^2) includes the waters from the 200 m isobath to the outer Australian Fishing Zone. Fishing is by demersal trawlers, with greatest catches in the 400–450 m depth range. Two species of carids and four species of penaeids are caught, totalling 850 t in the 1987/88 logbook year.

The red prawn, *Aristaeomorpha foliacea* (Decapoda: Aristeidae), dominates the catch in weight and commercial value. In 1987/88, 420 t of this species were caught; catch rates were usually between 25 and 75 kg hr^{-1}. *A. foliacea* is caught in a limited area south of Rowley Shoals, in large daytime aggregations. The size composition of the catch is being studied to determine growth rate and life span. Males have a petasma which is recognised at >17 mm carapace length (CL); development of sperm ducts occurs at >21 mm CL. Female reproductive maturity is marked by the presence of a sperm plug (at >26 mm CL) and the caudal extension of the ovarian lobes. Males in reproductive condition and females with sperm plugs are present throughout the year. The size-distribution of males is unimodal; that of females is polymodal, with at least three recognisable year-classes. Females usually outnumber males in samples and at sizes >40 mm CL, females dominate the catch.

Other commercial species are distributed over a greater geographical area than *A. foliacea*; these include *Aristeus virilis* and *Plesiopenaeus edwardsianus* (Aristeidae), *Penaeopsis eduardoi* (Penaeidae), *Haliporoides sibogae australis* (Solenoceridae) and the carid species *Heterocarpus sibogae* and *Heterocarpus woodmasoni* (Pandalidae).

Deepwater prawn fisheries in other parts of the world use halted traps (e.g. tropical Pacific Islands) and trawl nets (e.g. off Spain, north-west Africa, Italy, and south-west India). By comparison with these fisheries, the slope of northwestern Australia provides favourable catch rates and a variety of commercial crustacean species.

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